



The IEV/AIE Assessment
Of

ICDB:
INTEGRATED CLINICAL DATABASE PROJECT

For the U.S. Air Force Medical Service

December 2002

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Executive Summary

This is an Information Economic Value/Applied Information Economics (IEV/AIE) based analysis of the AFMS investment in the Integrated Clinical Database (ICDB) Project. The Hubbard Ross approach quantifies factors normally considered to be intangible or “soft”, and the IEV/AIE method measures risk against return in a financially meaningful way.

Investment Decision

The investment analyzed is the ICDB Project. The decision to be analyzed answers the questions: A) Was the original decision to proceed with the ICDB implementations justified given what we know now?, and B) Is a decision to proceed with ICDB server installation in the remaining 90 CHCS sites across the MHS (enabling access by all MTFs, including satellite facilities) justified? Justified in this context means that the expected return is high enough relative to identified risks. Hubbard Ross conducted a risk/return (IEV/AIE) analysis on the investment to answer these questions.

Investment Definition

The investment is a worldwide deployment consisting of ICDB. The “standard tools” are: 1) A Nurse/Technician Portal for improving clinic efficiency; 2) A Physician Portal for “point of care”, enrollee-centered effectiveness; and 3) A uniform development platform for sharing of independently developed applications (current and future) such as “HealtheForces” tools (Walter Reed Army Medical Center) for Population Health and Disease Management, Infectious Disease Tracking (Wilford Hall Medical Center), and the Health Electronic Record System for Women (Walter Reed Army Medical Center).

Assumptions

To insure a conservative economic value model, the following investment assumptions were used: 1) Each MTF was modeled using only two (2) clinics; namely, internal medicine and family practice. 2) Benefits were calculated using only 90 MTFs of “average” size (corresponding with CHCS host sites ONLY and not including the potential benefit derived by satellite facilities). 3) The number of benefits modeled were limited to those needed to justify this decision.

Cost

The total estimated cost over the next 5 years is \$27.9M. Implementation cost is \$8.2M in CY2003 for 90 ICDB server sites located at CHCS server sites. Sustainment costs are \$4.3M annually for 2004 through 2007 with a hardware/software refresh in 2007 at \$2.5M. However, estimating the risks adjusted expected investment to \$32.4M.

Benefits

Benefits begin as soon as access is available in the MTF but were assumed to start in 2004. They were identified, clarified and measured by knowledgeable participants. Information was supplied in two on-site meetings at Walter Reed Medical Center followed by multiple conferences calls, email correspondence and survey instruments. There were three major sources of benefits identified: First, the use of the technology by physicians, nurses, technicians and other personnel associated with a MTF. The most often repeated benefit expressed here was time saved during patient visits because of the easy accessibility to up-to-date medical information. Second, those benefits resulting from independently developed applications running on the ICDB platform. Third, those benefits resulting from the availability to MTFs of a uniform, open-architecture development platform that can accelerate development, reduce cost and increase sharing for ICDB resident applications.

Risks

Risks fell into four categories: 1) Chance of cancellation, 2) Availability of resources, 3) Technical uncertainty, and 4) Rate of change. These risks came from multiple sources and paralleled those in the IM/IT Scoring Criteria Matrix. All were included in the economic model for ICDB risk/return. They added to chance of cancellation, lower utilization, time delays and higher costs. The findings that follow include the full impact of these risks.

Findings

The analysis of the ICDB investment returned a very high IRR (106%) and NPV (\$32.3M). Payback occurs in the first year after server implementation is complete. The return on the investment results from the gain realized by the benefits (less than ½ of those available were modeled) to providers, nurses and technicians in the clinics at the “point of care.” As more clinics and clinic personnel become familiar with and are able to access ICDB, the benefits will increase proportionately. Conversely the longer it takes to make this technology available across the MHS, the more potential economic return is lost.

Recommendations

We recommend: 1) ICDB installation in all 90 MHS CHCS sites as fast as possible, 2) Accelerate implementation of access to ICDB across all MHS MTFs, 3) Develop comprehensive support and training programs to enable benefits earlier, 4) Optimize results with a periodically updated IEV/AIE model that measures risk mitigation and benefit realization, and 5) Measure the net gains for new, locally developed applications prior to deciding whether to deploy on ICDB.

1 INVESTMENT DEFINITION

The investment is ICDB: Integrated Clinical Database Project For 90 sites throughout the MHS

The Integrated Clinical Database (ICDB) investment is an integration platform designed jointly by providers and IM/IT staff. It is a system intended to facilitate collaboration, and to give TMA, the individual services and MTF staff easy access to clinical data in order to meet their mission-specific tasks.

The mission of the ICDB Program Office is to integrate data from diverse clinical information systems into a single, uniform, open-architecture platform that facilitates the rapid development, prototyping, deployment and sharing of leading-edge tools that support local commanders and their staffs in meeting both their unique, MTF specific missions and the MHS strategic goals.

The ICDB project is designed to deliver a set of electronic tools that can be used by personnel in a Medical Treatment Facility to leverage legacy data systems through Web-based capabilities. It uniquely enables data availability in support of Population Health Management efforts and the clinical requirements of providers and their patients. The ICDB is a system of systems that extends the reach of other existing clinical systems and creates a synergy of patient-centric, actionable information at the point of care.

accomplished with several meetings in Washington DC with stakeholders knowledgeable about the project. In the business sector, this step is accomplished through meetings with the appropriate program owner, sponsor and team members who are the investors in the new technology or services.

1.1 Objectives of the IEV/AIE assessment

The objectives of the first step of this assessment are to:

- provide a brief description of the investment decision (situation, status, strategy)
- define the investment using specific criteria (scope)
 - List the benefit elements
 - List the cost elements and
 - Identify the risk factors

However, it is important to note that if a Risk/Return Analysis (RRA) project, which is being done here, is part of a portfolio analysis, Hubbard Ross would construct a **Confidence Chart** (described in 1.4) at this point in the process. In using a Confidence Chart, if a project falls within the acceptable range on the chart, no analysis is necessary and the recommendation is to simply accept (or reject) the project with no further analysis. Projects like ICDB that are large, over \$5 Million and with some risk, normally require a RRA. To meet the time requirements of the project, the Confidence Chart process will be described later but not implemented here as we move through the Investment Definition phase.

The first two steps in the process, the Investment Definition and the Definition Clarification were

1.2 The Process

Initiating the ICDB investment analysis took the form of a series of telephone conferences between the consultants and the project owner. These phone conferences resulted in a large scale view of the investment and a beginning identification of those participants who had in-depth knowledge of the cost, benefits and risks of the Integrated Clinical Database (ICDB) project. Further, the phone calls served to provide, to the consultants, information regarding the Air Force and the TRICARE System of providing health care to the military population: active duty, retirees and families.

The ICDB project principals were marginally familiar with the IEV/AIE methodology. Using among other strategies, Bayesian analysis, Monte Carlo simulations, and subjective linear analysis, IEV/AIE is about reducing uncertainty and making decisions and less about processing statistical data. We use an approach to large Information Technology Investments focusing on IT as an investment that is action-oriented and consistent with how most organizations look at large scale capital spending. The key elements are resources to be invested, losses and gains to be realized. And, since there is a need to be explicit about the variables, the major task is defining these elements.

The investment definition uses information already available and taken from existing documents. The breadth of the ICDB analysis is significant, covering implementation of the ICDB platform in a variety of Military Treatment Facilities. The Military Treatment Facilities (MTFs) are broadly similar but not entirely identical. Further, the ICDB platform was implemented at different time intervals and in clinics where personnel had varying degrees of familiarity with its capabilities.

At this stage the task is to define the variables to be measured. It is considered that the cost variables will be obtained from those most knowledgeable, namely, those who have been introducing and installing the ICDB platform, the ICDB program office. However, the benefits and risk variables need to be obtained from those who have been using ICDB or are most knowledgeable about the anticipated benefits. Once the variables have been identified, the participants are asked to give rough estimates of the value of the benefits and risks. Later the estimates will be refined.

To arrive at a beginning list of benefits and risks it was necessary to hold two meetings with stakeholders. The first was held over a two-day period and attendees included:

Lt Col Jaime Rosado (ICDB Program Office)
COL Jill Phillips (Walter Reed Army Med. Ctr.)
Dr. Carolyn Hamm (Walter Reed Army Med. Ctr.)
Lt Col (Dr.) John Poremba (Malcomb Grow Med. Ctr.)
Maj. Lew Martin (TRICARE, Region 10)

Follow up correspondence with the participants included a summary of notes from the first meeting and a questionnaire asking for clarification of the benefit statements along with a rough estimate of the value of each benefit to be reported as a range with a lower and upper bound. Results would be reviewed and discussed at the next (2nd) meeting to be held a month later.

The second meeting included the following participants:

Lt Col Jaime Rosado (ICDB Program Office)
Lt Col Sherry Herrera (USAF Academy)
Capt. Brian Kittleson (USAF Academy)
Major Lew Martin (TRICARE, Region 10)
LT COL Carla Cassidy (Walter Reed Army Med. Ctr.)

Again, discussion centered on the benefits of using ICDB, and translating some of the intangible statements into measurable units. The afternoon session was devoted to training the participants in estimating techniques and honing their ability to estimate with a 90% confidence in their responses.

It was decided to investigate the ICDB performance in 2 clinics, Family Practice and Internal Medicine and its usefulness to providers, nurses and technicians. The results from the meetings and follow up correspondence are contained in Appendix A.

1.3 Description

The "beta" investment that is being considered for worldwide deployment consists of a hardware platform (web server, database server & interface Server) that supports an Oracle database. The "standard tools" being deployed are:

-- A Nurse/Technician Portal for managing clinic operations at the "point of care" and for limited outreach efforts;

-- A Physician Portal for "point of care" assistance and relationship management between the provider and their enrolled population.

--Additional deployments are the HealtheForces (HeF) Tools for tracking and measuring efforts in Population Health and Disease Management (See scorecard.) The tools developed at Walter Reed are in beta at Madigan Army Medical Center, Seattle, TRICARE, Region 11.

--A most recent addition to deployment efforts is the Wilford Hall Medical Center (Texas) "Infectious Disease" tracking program in use and being prepared for release to other MTFs.

--Another timely application is the Health Electronic Record system (HERS) for Women. Current development at Walter Reed Army Medical Center (scheduled for release in Jan/Feb 03) includes support for Women's Health Initiatives in the areas of 1) GYN Well Woman, 2) Colposcopy and 3) Ambulatory OB support.

The Hubbard Ross IEV/ AIE methodology will be used to analyze the multi part question:

Is the return and the risk on the ICDB project investment acceptable: and is the decision to proceed across the MHS (the remaining 90 CHCS sites) the right decision given what we know now?

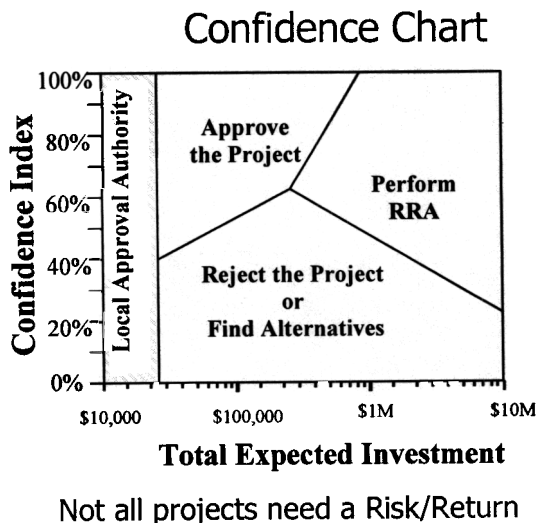
1.4 Confidence Chart

This analysis for the Integrated Clinical Database project called for using the IEV/AIE complete Risk/Return (RRA) Analysis method at a high level. As a general rule, Hubbard Ross develops a **Confidence Chart** for organizations whose interest is in using quantitative methods to determine the advisability of initiating or proceeding with IT investments as part of a portfolio. Because we believe in measuring only what is necessary, a **Confidence Chart** allows an organization to quickly look at predefined variables within an investment and decide whether or not it's necessary to do a complete quantitative analysis (RRA).

The following Confidence Chart is typical for most organizations. In developing a customized Confidence Chart for TRICARE it would reflect the historical decision making criteria used for previous large scale technology investments. The process plots the confidence of decision makers about the success of a project against the size of the project using a linear analysis or a bootstrapping methodology. Used regularly in Decision Analysis,

bootstrapping improves the intuitive judgments provided by the organization's decision-makers. Research has demonstrated that linear bootstrapped models outperform simple intuitive judgments *in almost every study*. (Russo & Shoemaker, U. of Chicago, Cornell.)

Confidence Chart Example:



1.5 Assumptions

To insure a conservative economic value model, the following investment assumptions were used: 1. Each MTF was modeled with two (2) clinics; namely, internal medicine and family practice. 2. Benefits were calculated using 90 (of 228) MTFs of average size. 3. The number of benefits modeled were limited to those needed to justify this decision. For a complete set of assumptions see Appendix B.

1.6 Expected Benefits

Participants cited a number of expected benefits of ICDB however, it was agreed that all benefits would be listed but only the most important of those described would be modeled. The benefits included:

A. THOSE BENEFITS ACCRUING AS A RESULT OF THE USE OF ICDB BY PHYSICIANS, NURSES, TECHNICIANS AND OTHER PERSONNEL ASSOCIATED WITH A MEDICAL TREATMENT FACILITY.

B. THOSE BENEFITS DERIVED AS A RESULT OF APPLICATIONS SITTING ON THE ICDB PLATFORM, DEVELOPED INDEPENDENTLY BY MILITARY UNITS AND SPECIALIZED IN NATURE, SUCH AS HEALTHeFORCES, (OUTCOMES MANAGEMENT INITIATIVE), INFECTIOUS DISEASE CONTROL ETC.

C. THOSE BENEFITS RESULTING FROM USE OF THE TECHNOLOGY ITSELF

Some of the benefits, which were described in the initial identification session as a result of the Provider Portal, the Nurse Portal and HealtheForces initiative, are included in the following first iteration. The full list, not included here, is in Appendix A and demonstrates the reach of this technology through the eyes of the users.

PROVIDER PORTAL, tailored to allow a PCM to manage their enrolled population

Patient tracking ER and Admission piece

2. List by chronically ill patients and their disease specific information (i.e. Diabetes)
3. Identifies which patients are due for clinical preventive services not related to current visit.
4. Documentation, accessibility of medical information when paper records are not available.

NURSE PORTAL, tailored to patient panel as defined by PCO team members (nurse, technician etc.)

1. Nurse or technician can go to various teams so they can float easily
2. Changes ability to do staffing easily.
3. Portals can provide data quality visibility
4. Availability of information when paper record not accessible.
5. Aggregate data from various sources to create integrated view of patient data
6. Use web based tools to quickly update, and make available integrated medical information.
7. JACHO Screenings

The following benefits resulted from input by the participants representing the HeF initiative. Time would not permit measuring these benefits but it was felt they were significant enough to at least include them as having been reported.

HEALTHeFORCES (HeF) BENEFITS

- Chronic disease management
- 2. Supports utilization of practice guidelines
- 3. Operationalized the DOD-VA-RAND GROUP effort (CPG)
- 4. Standardize Patient Education
- 5. Supports JCAHO
- 6. Standards referral guidelines
- 7. Surveys and gathers Patient input re: Quality of life, Functional status, Depression screen, Screens for education gaps and disease knowledge gaps
- 8. Disease specific scorecard (DQIP etc.)

1.7 Expected Cost Elements

There was little disagreement about the cost elements. It was estimated that the total investment cost for the 90 ICDB server sites expected to be completed over the next five years was \$27.9M. of which \$8.2M was for implementations in 2003, \$4.3M annually for sustainment in 2004 through 2007, and a hardware/software refresh @ \$2.5M in 2007. However, estimating the risks adjusted expected investment to \$32.4M. The CBR model in Appendix B reflects the cash flow 2003 through 2007 for the implementation and sustainment of ICDB.

1.8 Risk Factors

Risk factors are defined as the probability of an undesirable event. This is frequently shown as a probability that the benefits will not be realized. It is demonstrated in the spreadsheet as a given calibrated estimate of the benefit with an upper and lower bound and best estimate. The impacts of risk are:

- Increased project cost (scope creep).
- Implementation extension;
- Later and slower utilization of capabilities (acceptance and utilization)
- Greater chance of cancellation.

Since risk estimates were not given by participants who had gone through the calibration workshop, broad ranges were put on the estimates and a calculated factor was mathematically determined for each.

Risks that the participants cited and discussed included:

1. Sites will need financial investment, PCs or Staff
2. Risk of utilization, might not want to use
3. Reluctance to change
4. Corporate short-sightedness
5. Waiting for CHCS II equivalent functionality
- 6.
7. Inter-service rivalry, not sharing development efforts
8. Competing products
9. Order entry capability missing, need to go to CHCS for this task.
10. May have enough SILO databases, don't want to do anything else
11. Appointment scheduling, through dumb terminal
12. Hi-level of skill and resources: a. to use HeF or other specialized applications and b. ICDB tools require PC interfaces.
13. Adequate training needed.
14. Certification and Accreditation needed
DITSCAP & AF CON

Additionally, review by the Air Force Medical Operations Agency indicated the following risks:

1. Incomplete DITSCAP/CON/CTO
2. Aggressive deployment timeline
3. Anecdotal feedback that user deployment training and support is inadequate
4. Site support requirements post-deployment are greater than anticipated in order to realize all benefits of program
5. Inability to easily export data to other sites or applications; data entered into ICDB may not also be in paper record and may not accompany patient in the event of PCS, TDY, etc.
6. HIPAA Compliance
7. Population Health Data displayed by ICDB is incomplete; data on ICDB different from AFMS Population Health Portal (PHP) because PHP always displays aggregate data from CHCS and other data sources
8. ICDB is perceived by some as a competitor with CHCS II or Easy CHCS.
9. Concern that deploying ICDB will create another system that is not integrated with AFMS or MHS architecture, applications etc.
10. Easy CHCS will provide very similar capabilities
11. Does not support order entry, so toggle necessary between ICDB and CHCS
12. ICDB does not receive data from PIMR, AFCITA or other AF or MHS programs, limiting its clinical usefulness.
13. Lack of data on user satisfaction
14. Lack of on-going formal functional users group (FUG) to develop new potential requirements; lack of corporate oversight or input into development of new capabilities
15. No central oversight of locally developed or modified extender applications.

Risks were reviewed and consolidated as follows:

1. Chance of cancellation:
 - Change in DOD Strategic Priorities
 - Change in MHS Strategic Priorities
2. Availability of Resources:
 - New Hardware Required
 - New Software Development Required
 - Training Required.
3. Technical Uncertainty
 - Incompatibility with the MHS Architecture Components. Need to modify ICDB or the Infrastructure.
 - Cost and Schedule Risk
4. Rate of Change
 - Medical Care Process in the clinics
 - Definitional Uncertainty and Degree of Complexity.
 - Accelerated deployment of Applications with uncertain net benefit

1.9 Conclusion & Recommendations

The Hubbard Ross assignment is to perform a Risk/Return Analysis using the expected benefits of this ICDB Investment that demonstrate the greatest potential to be of significant value. The size and complexity immediately suggested that a full Risk/Return Analysis (RRA) be performed. This analysis includes the most critical risks and a sufficient number of benefits to show, if possible, an acceptable NPV (Net Present Value) for the ICDB investment. The project has been sufficiently defined to proceed to Definition Clarification.

2. DEFINITION CLARIFICATION

Definition Clarification involves factor analysis and refinement of the information received in the first step. Intangible variables were converted into measurable statements. Those considered the most important were:
a) Benefits that optimize Enrollee visits by facilitating Providers time management in MTF clinics, b) Decreased Time to Market across TRICARE for new applications and Increased Market Share for said applications, c) IM/IT Development Time and Cost Reductions.

2.1 Objectives

The focus is on the design of the model to be used to analyze the investment by converting the intangible costs, benefits and risks into measurable statements or units and proceeding with the constructing of the cost/benefits/risks (CBR) model.

2.2 Approach

During Definition-Clarification, multiple phone conferences, workshops and survey instruments focused on translating the “intangibles” identified in the Investment Definition into well-defined measurable variables. The methods for doing this are based on the use of proven AIE methods in a “Definition Workshop”. These methods coach the people who originally identified the intangibles so that they can articulate the benefits and risks in more precise terms.

Once ambiguity is removed and more precisely defined variables are identified, a spreadsheet is constructed to insert these new variables into a cost/benefit/risk (CBR) model.

For this ICDB investment, the clarifying step was conducted through workshops, telephone conference calls, emails and survey instruments with those most involved with and knowledgeable about the ICDB Project. Additionally representatives from other MTF units with an interest in this project from various perspectives were interviewed and their input was considered in the analysis. Among these were:

Lt Col Brian Masterson	Dr. John G. Meyer
Maj. Kevin Helmrick	Lt Col Jeffrey Kueter
COL Rosemary Nelson	Lt Col Paul Friedrichs
LT COL Jay Carlson	Ms. Jan Sandmire

2.3 Resolving Intangibles

The list of multiple benefits and risks were filtered for significance and collapsed if they were redundant.

Benefits and risks were either included in the spreadsheet as a measurable tangible, consolidated with another tangible to be measured or a decision was made not to include it. The decision not to include a factor would most frequently be based on the opinion that it might be too difficult to model in the time allotted *and* that the effect on the economic return was probably not significant. It is important to note that there were wide ranges in the responses to the questionnaires.

For a complete list of the intangible benefits and risks and how they mapped to the cost/benefit/risk model, refer to Appendix A.

The most compelling of the expected benefits for the Integrated Clinical Database Program Investment fell into three major measurable categories. These were developed as a result of identifying the benefits and clarifying the intangibles. These categories are:

1. MTF Provider Time Savings
2. Accelerated Application Utilization across AFMS (not modeled)
3. IM/IT Development time and cost reductions.

Each of these categories contains specific factors that are defined as variables in the CBR model. Risks were converted into tangible quantities and have the effect of reducing the benefits or increasing costs.

Broad ranges on known variables represent our uncertainty about all CBR variables. For example, the maximum time to retrieve one enrollee's clinical information for a visit if using CHCS is modeled as a range with a low of 4.0 minutes to a high of 13.6 minutes vs. ICDB time of from 2.0 minutes to 7.0 minutes.

2. Once the project is started, the chance of cancellation becomes a critical risk.
3. Probability distributions for each quantity are identified in the CBR model Excel spreadsheet in Appendix B.

2.4 Cost/Benefit /Risk (CBR) Model

The investment analysis yields an Internal Rate of Return (IRR) and a risk adjusted Net Present Value (NPV). The model was designed using 6% cost of capital and a 2% inflation rate over a 4-year period with the Fiscal Year 2003 represented as Year 0. The decision posed in the CBR model was, should ICDB be implemented now in the 90 additional CHCS sites in the MHS or wait for equivalent CHCSII functionality? The Hubbard Ross model counts benefits as the difference in time savings between ICDB and the currently operational CHCS system and only until the equivalent CHCSII capability becomes available.

Benefits were defined as differences in the ability to retrieve clinical information based on using ICDB vs. CHCS or other currently available systems. Further, benefits result from the development reduction time/cost for new applications and implementation of the Hub.

Since this project is limited in scope, it was decided to use the obvious “low hanging fruit” in assessing the benefits; stopping when justification for the project was significantly exceeded or when the multiple other benefits were overly time consuming to measure, i.e. economic effect of better care, Health e Forces benefits, optimal scheduling.

2.5 Conclusion & Next Step

The decision model, at this point, is sufficiently well defined to proceed to Quantify and Measure.

3. QUANTIFY AND MEASURE

Most measurements were from estimates and standard metrics. Hubbard Ross' process is to receive estimates from members of the team who have completed the calibrated estimating workshop and give, with a 90% confidence level, estimates that reflect their uncertainty regarding the factor ranges. Herein, most of the information was received by survey and calibrated estimators were not the respondents. Since non-calibrated estimators supplied the information, adjustment factors were used to broaden estimated ranges thereby increasing the confidence of the estimates. A decision to proceed with the analysis was justified given the current level of information.

3.1 Purpose of This Section

The objective of this step is to provide a measurement for each of the variables in the CBR model.

3.2 Approach

Measurement is conducted in an iterative process. Initial estimates had been rough numbers and in this step they are refined and the model design is finalized. The refinement process is repeated until the variables to be included in the model have been confirmed.

The first stage of measurements is almost entirely from "calibrated estimates". Estimators are individuals trained in expressing their uncertainty quantitatively. Estimates are represented by a probability distribution. A few other initial quantities are provided by the organization as financial standards (the cost of labor, etc.) More extensive measurements, such as controlled experiments or scientific sampling methods, are used when justified.

3.3 Initial Measurements

As is usually the case, all initial measurements were based on calibrated estimates. For the few variables not measured by calibrated estimators specific sources can be cited. Because much of the information was gathered via a survey instrument calibrated estimates were not universally available.

Note: Some of the calibrated estimates changed several times as the clarity of the definitions and value of the benefits and risks for ICDB evolved. This deliverable describes only the latest and - and most realistic - version. In all instances, as values ascribed to the benefits and risks were analyzed, only conservative and prudent measures were accepted.

3.4 Information Analysis

Even though the chance of cancellation was estimated to have a mean of only 12 %, this remains the most significant uncertainty. It has a value of "perfect information" of approximately \$283,000. However, a 12% chance of cancellation approaches the maximum practical certainty about the completion of any project of this size and it is unlikely that additional analysis efforts would realistically reduce it.

It is usually recommended spending about 10% of the computed perfect information value on further measurement efforts. This would indicate that an effort of \$28,000 is justified for further measurement of this variable. If practical, it is important to minimize the possibility of cancellation.

3.5 Results: Additional Measurements

An additional measurement is recommended that can be implemented by the "formal functional user's group." For each application, that is a candidate for the ICDB platform, an assessment should be undertaken to ensure that there will be a net gain from installing the application. See details in the Recommendations section.

3.6 Conclusion and Next Step

None of the variables require additional measurement before proceeding with modeling.

4. MODELING

RISK/RETURN ANALYSIS (RRA)

Risk Return Analysis of the ICDB investment indicates that the risk is entirely acceptable given the large expected return. Almost all risk is the chance of cancellation. The risk of “scope creep” is low which is extremely favorable since our research indicates that the real loss is not the cost of time overruns but the failure to gain the benefits that are lost when a project is not completed on time. In the case of ICDB scope creep is insignificant. All current projects and deployments have been delivered on time and on budget. There is only a 1% chance that a successfully implemented project will have returns too low to break even.

4.1 Objective

The objectives of the Risk Return Analysis is to:

1. Identify whether the ratio of expected return to the risk of loss is compatible with the MHS' investment criteria, and
2. Identify the sources of risk.

The results are used to plot the position of the ICDB project on the MHS' simulated risk/return profile. As a result, the project called for Hubbard Ross to simulate an MHS risk/return profile. Normally information would be provided by an IT investment decision maker; however this simulated risk return profile represents a typical profile and is a reasonable profile for MHS.

4.2 Approach

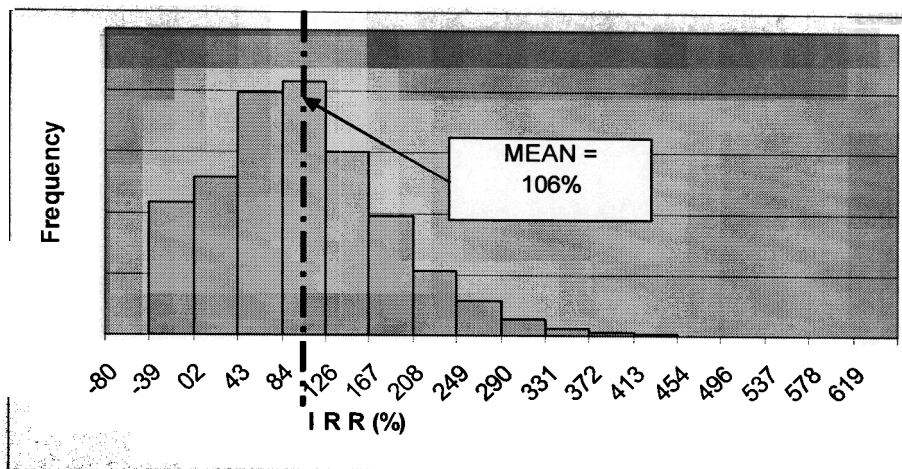
This approach is based on financial portfolio management methods. The tools used in this step are the Excel spreadsheet and an Excel macro for generating the "Monte Carlo" simulations. This analysis uses the following definitions for risk and return:

Return: The “expected” IRR (that is, the probability-weighted average of all possible IRR's) over 4 years from the start of benefits of the investment.

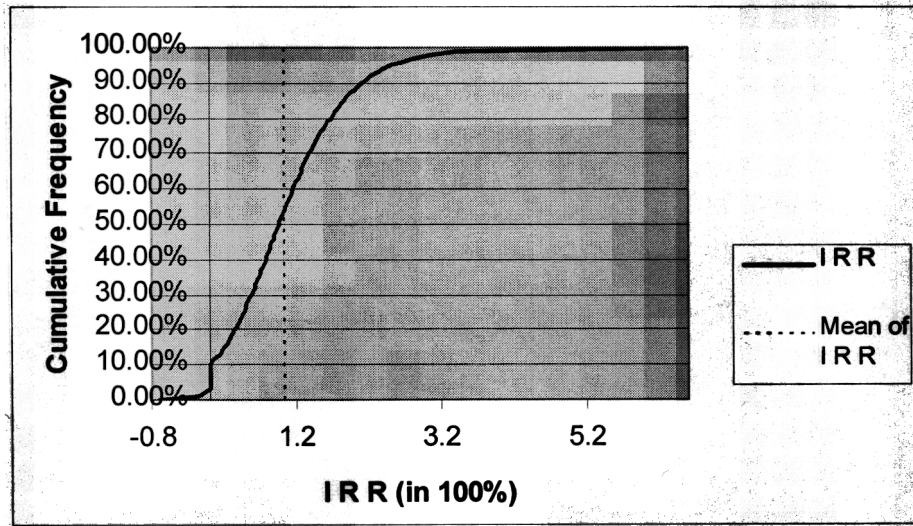
Risk: The probability of receiving a negative IRR.

4.3 The Risk/Return Position of ICDB

A Monte Carlo simulation of 20,000 scenarios was conducted. The distribution of the resulting IRR's is shown in the graph titled "Distribution of ICDB Returns". Ten percent (10%) of the 20,000 scenarios produced a negative return. This was directly due to project cancellation. The average IRR over all 20,000 scenarios is 106%. IRR is the internal rate of return where the Net Present Value (NPV) of all cash flows is equal to zero.

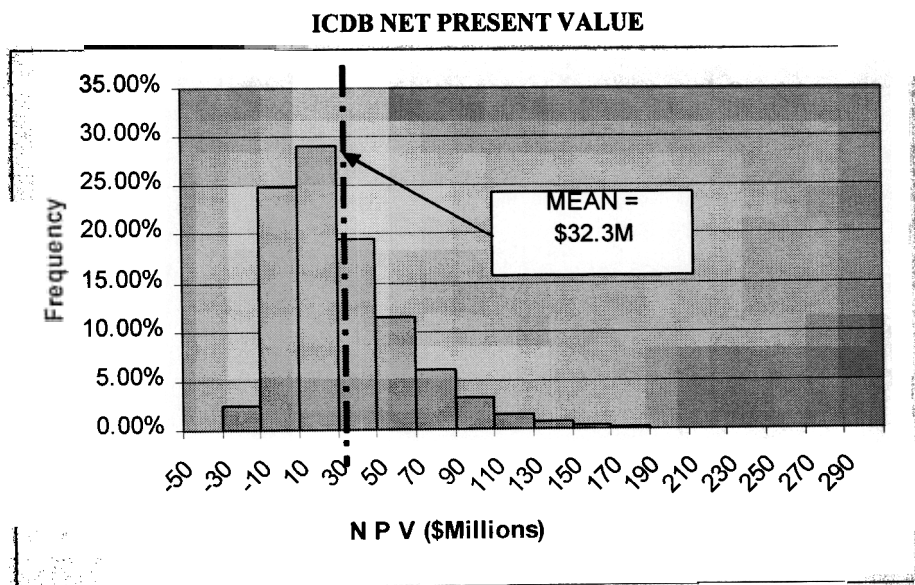


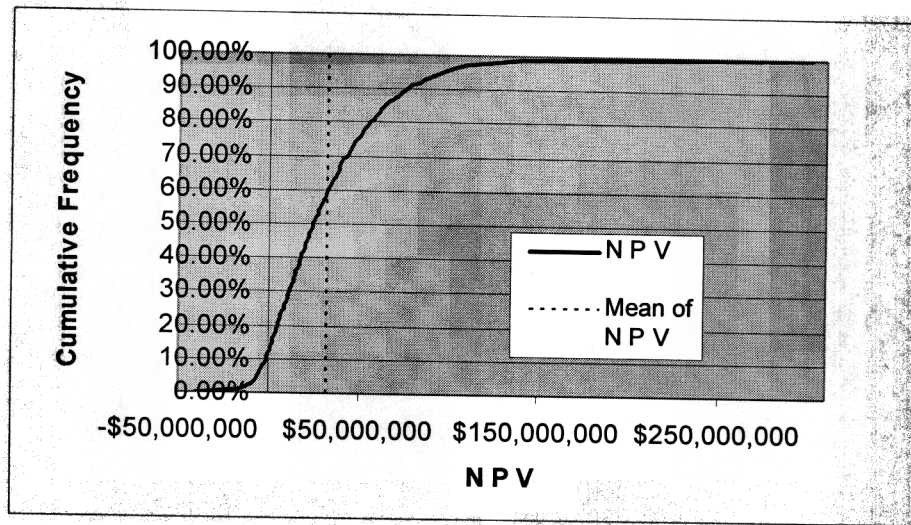
Distribution of ICDB Returns – 20,000 Scenarios



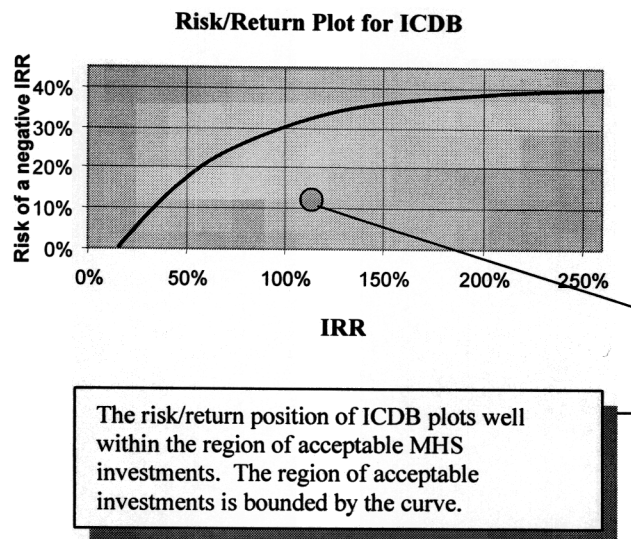
Probability of a Negative IRR=10%

The following charts represent the Net Present Value of the ICDB investment. NPV is defined as the present value of all cash inflows from the project compared against the initial investment. The NPV which is the difference between the present value and the initial investment determines whether the project is an acceptable investment. The cost of capital is used as the discount rate. Under this method, if the NPV is positive, the project should be accepted.





In the next graph, a typical Risk/Return Plot was used from the business experience of Hubbard Ross for the simulated MHS Plot. The expected IRR was plotted on the horizontal axis and the percentage of negative IRR's was plotted on the vertical axis as risk. This ICDB investment (shown by the dot on the graph) is well within the SIMULATED region of acceptable MHS investments.



4.4 Conclusion and Next Step

The risk/return analysis conducted shows that the ICDB project has an acceptable risk given the expected return. The risk/return analysis also identified the most significant risk factors in the decision. (See CBR Model Appendix B.) The next step is to issue recommendations concerning the investment decision.

5. FINDINGS & RECOMMENDATIONS

The ICDB investment returned a high IRR and NPV as modeled. This return on the investment results from the economic gain realized by the benefits to providers, nurses and technicians in the clinics at the “point of care.” As more clinics and clinic personnel become familiar with and are able to use the ICDB access to up-to-date information, the benefits will increase. Conversely, the longer it takes to make this technology available across the MHS, the more potential economic return is lost; therefore, our recommendations are:

1. ICDB installation in all 90 MHS CHCS sites as fast as possible.
2. Accelerate the implementation of access to ICDB across all MHS MTFs.
3. Develop comprehensive support and training programs to enable benefits earlier.
4. Optimize results with a periodically updated IEV/AIE model that measures risk mitigation and benefit realization.
5. Measure the net gains for new locally developed applications prior to deciding whether to deploy on ICDB.

5.1 Objectives

The Recommendation Section summarizes the results of the AIE assessment and issues clear recommendations to support the decision-making process.

5.2 Approach

The recommendations are based on the results and findings obtained during the previous steps. The position of the investment and the risk return profile of the investment are primary considerations in recommending for or against the investment. Equally useful is the magnitude of NPV @ \$32.3 Million. Identification of critical risks and how to deal with them has very high value.

5.3 Findings

The analysis of the ICDB investment returned a very high IRR (106%) and NPV (\$32.3M). Payback occurs in the first year after server implementation is complete. The return on the investment results from the gain realized by the benefits (less than ½ of those available were modeled) to providers, nurses and technicians in the clinics at the “point of care.” As more clinics and clinic personnel become familiar with and are able to access ICDB, the benefits will increase proportionately. Conversely the longer it takes to

make this technology available across the MHS, the more potential economic return is lost.

5.3 Recommendations

AIE analysis indicates that the MHS should proceed with the implementation of the Integrated Clinical Database project as fast as practical. Consequently, it is also concluded that the original investment decision by the AMFS was fully justified.

Additional measures to improve utilization of ICDB should be implemented to deliver at the earliest date the high yield returned by the benefits. On going benefit optimization and risk mitigation should be scheduled using an update of this RRA on a periodic basis. This would also show the magnitude of the value lost if, for any reason, cancellation becomes a possibility.

Further, there is still a small risk that an application could be added to the ICDB platform that does not generate a net gain and it could afford to wait for full equivalent CHCSII functionality. We recommend, as part of their evaluation criteria, that the “functional user group” use a “solution space” analysis to enable a quick economic evaluation of any pending locally developed additions to ICDB. Before applications are added to the ICDB, an assessment should be made to ensure a net gain is realized by deploying this new application sooner rather than having them wait.

APPENDIX A

PROVIDER PORTAL

1. Patient tracking ER and Admission piece
2. Answers question: What is the last 30 days history re: admissions and emergency care
3. List of chronically ill patients by disease specific information (Diabetes.)
4. Identifies which patients are due for clinical preventive services not related to current visit.
5. Documentation, accessibility of medical information when paper records not available.
6. Primary Care Optimization—PCO reflected in outreach to those who are due and not scheduled
7. Patient Identification
 - a. Acute episodic care—E.R. and Admissions Today
 - b. Chronic Illness-clinical preventive services
 - c. Prevention Intervention – outreach to those who are due and not scheduled
 - d. Summary of Care
 - e. JACHO Screenings
 - f. Notification
 - g. Communicating to your patient.

MEASURABLES

Time to retrieve 1 enrollee's clinical information.

Time required to access full summary

Time to retrieve information on 1 disease specific panel.

Time to ID patients to phone for add. Services

Time to ID patients to be phoned

Time required to access full summary

Time to ID patients to phone for add. Services

ID resulting in enrollees in preventive care

Time required for 1 mgmt. report

Time to update for JACHO requirements

Information retrieved resulting in enrollee educ.

NURSE PORTAL Work as a Team

1. Nurse or technician can go to various teams so they can float easily.
2. Changes ability to do staffing easily.
3. Portals can provide data quality visibility.
4. Availability of information when paper record not accessible.
5. Aggregate data from various sources to create integrated view of patient data.
6. Use web based tools to quickly update, and make available integrated medical information.
7. JACHO Screenings.
8. Different view.
9. Primary Care.
10. Efficiency is administrative in nature not clinical.
11. Platform for research.
12. Remediation to JACHO Type 1 write up @ Wilford Hall.

Time to access information.

Time to access full summary/enrollee info.

Time to access full summary/enrollee info.

Time to retrieve information

Time required for data mining

Time required gathering data for "lost records"

Time to update records per JACHO requirements

Time to access full summary / enrollee info

Time to update records

Time to access full summary

Time to ensure JACHO compliance

Time to ID enrollees to be phoned

Time to phone enrollees

The following benefits resulting from input by the participants representing the Outcomes Management Initiative. Time would not permit measuring these benefits but it was felt they were significant enough to at least include them as having been reported.

HEALTHeFORCES BENEFITS

1. Chronic disease management
2. Supports utilization of practice guidelines
3. Integrates work already done
4. DOD-VA-RAND GROUP—
Operationalized this effort
5. Standardize Patient Education
6. Supports JCAHO
7. Standards referral guidelines
8. Surveys and gathers Patient input re:
Quality of life, Functional status,
Depression screen, Screens for
education gaps and disease knowledge
gaps
9. Calculate Body Mass Index (BMI),
10. Automatically refers to nutrition care
11. Vital signs and High Blood Pressure—
Auto referrals
12. Provides and automates clinical decision
support.
13. Clinic- Improves (A Safety feature)
Clinic Note—
14. Information can be forwarded
electronically
15. Tons of reporting tools
16. Tutorials
17. Clinic Notes
18. Troop Clinic --Score
19. Reporting Feature.
20. Score card,
21. Surveys (Deployment)
22. IMAP—
23. Quality of life Page Referral guidelines,
24. Signoff Signature,

**HEALTHeFORCES
BENEFITS WERE NOT
TRANSLATED INTO
MEASURABLE UNITS AT
THIS TIME.**

RISK FACTORS

Risk factors are defined as the probability of an undesirable event. This is frequently shown as a probability that the benefits will not be realized and as such is demonstrated in the spreadsheet as a given calibrated estimate of the benefit with an upper and lower bound and best estimate. Since our risk estimates were not given by participants who had gone through the calibration workshop, broad ranges were put on the estimates and a calculated factor mathematically determined. Risks that the participants were concerned about included:

1. Sites will need financial investment, PCs or Staff
2. Risk of utilization, might not want to use
3. Reluctance to change
4. Corporate sightedness
5. Waiting for CHCS
6. Inter service rivalry
7. Competing products
8. Unidirectional-Order entry needs to go to CHCS
9. May have enough SILO databases, don't want to do anything else
10. Appointment scheduling, through green screen
11. Above fixed, instant CHCS access
12. Deficient in skill level needed to use HEALTHeFORCES or other apps.
13. Hardware problem
14. Some training needed
15. ICDB air force certifications necessary

Availability of Resources

Rate of change, degree of complexity

Rate of change

Chance of cancellation- Change in priorities

Incompatible with MHS architecture

Chance of Cancellation. Change in priorities.

Incompatible with MHS architecture

Rate of change

Incompatible with MHS architecture

Incompatible with MHS architecture

Availability of resources

Availability of Hardware resources

Availability of educ. Resources

Change of cancellation

Additionally, a review by the Air Force Medical Operations Agency indicated the following: risks:

1. Incomplete DITSCAP/CON/CTO
2. Aggressive deployment timeline
3. Anecdotal feedback that user deployment training and support is inadequate
4. Site support requirements post-deployment are greater than anticipated in order to realize all benefits of program
5. Inability to easily export data to other sites or applications; data entered into ICDB may not also be in paper record

Availability of resources (hardware, software, training)

Availability of resources

Incompatible with MHS architecture

Incompatible with MHS architecture

6. And may not accompany patient in the event of PCS, TDY, etc.
7. HIPAA Compliance
8. Population Health Data displayed by ICDB is incomplete; data on ICDB different from AFMS Population Health Portal (PHP) because PHP always displays aggregate data from CHCS and other data sources
9. ICDB is perceived by some as a competitor with CHCS 11 or EZ CHCS.
10. Concern that deploying ICDB will create another system that is not integrated with AFMS or MHS architecture, applications etc.
11. EZ-CHCS will provide very similar capabilities
12. Does not support order entry, so toggle necessary between ICDB and CHCS
13. ICDB does not receive data from PIMR, AFCITA or other AF or MHS programs, limiting its clinical usefulness.
14. Lack of data on user satisfaction
15. Lack of on-going formal functional users group (FUG) to develop new potential requirements; lack of corporate oversight or input into development of new capabilities
16. No central oversight of locally developed or modified extended applications

Rate of change-Medical Care Process

Incompatible with MHS architecture

Change in Strategic Priorities

Change in Strategic Priorities

Rate of Change

Incompatible with MHS architecture

Incompatible with MHS architecture

Availability of Resources

Change in MHS Strategic Priorities

Risks were reviewed and consolidated as follows:

1. Chance of cancellation:
 - Change in DOD Strategic Priorities
 - Change in MHS Strategic Priorities
2. Availability of Resources:
 - New Hardware Required
 - New Software Development required
 - Training required.
3. Technical Uncertainty
 - Incompatibility with MHS Architecture Component Need to modify ICDB or the Infrastructure.
 - Cost and Schedule Risk
4. Rate of Change
 - Medical Care Process
 - Definitional Uncertainty, Degree of Complexity and Change Rate.

Rate of change-Medical Care Process